US009182906B2

(12) **United States Patent**
Borovsky et al.

(10) **Patent No.: US 9,182,906 B2**
(45) **Date of Patent: *Nov. 10, 2015**

(54) **MODE SWITCHING**

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(73) Assignee: **Nokia Technologies Oy**, Espoo (FI)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/594,238**

(22) Filed: **Aug. 24, 2012**

(65) **Prior Publication Data**

US 2012/0319984 A1 Dec. 20, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/874,206, filed on Sep. 1, 2010.

(51) **Int. Cl.**
G06F 3/041 (2006.01)
G06F 3/0488 (2013.01)

(52) **U.S. Cl.**
CPC ***G06F 3/04883*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 3/041; G06F 3/0412; G06F 3/0481; G06F 3/0483; G06F 3/04845; G06F 3/0488; G06F 3/04883
USPC 345/156–157, 168–169, 173–178; 715/863–864; 708/142–146; 341/22–28
See application file for complete search history.

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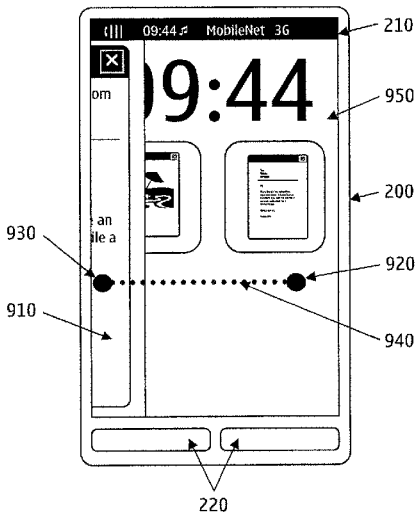
Primary Examiner — Jason Mandeville
(74) *Attorney, Agent, or Firm* — Alston & Bird LLP

(57) **ABSTRACT**

Based on one or more characteristics of a received translation input, a computing device is switched between two or more states. The translation input may be a touch input, for example a drag operation. The states may relate to locked and unlocked states, idle screens, or other suitable examples.

17 Claims, 15 Drawing Sheets



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2010/0248689	A1	9/2010	Teng et al.	
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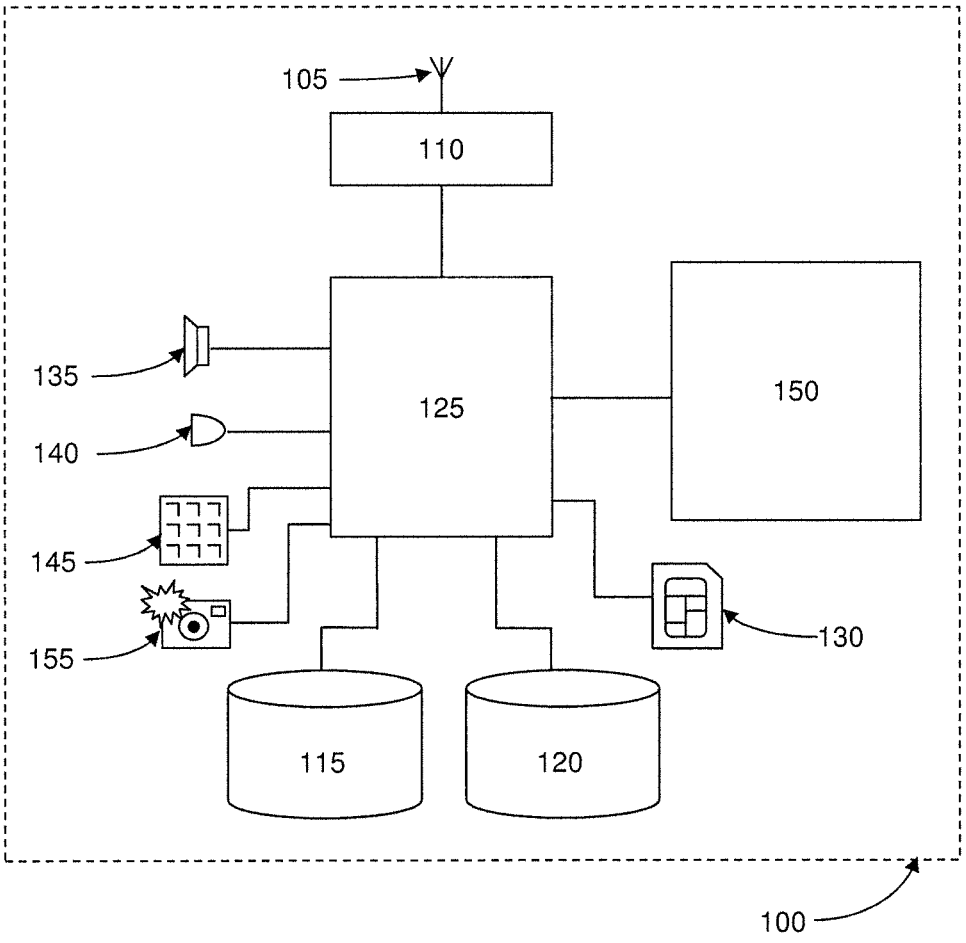


FIG. 1

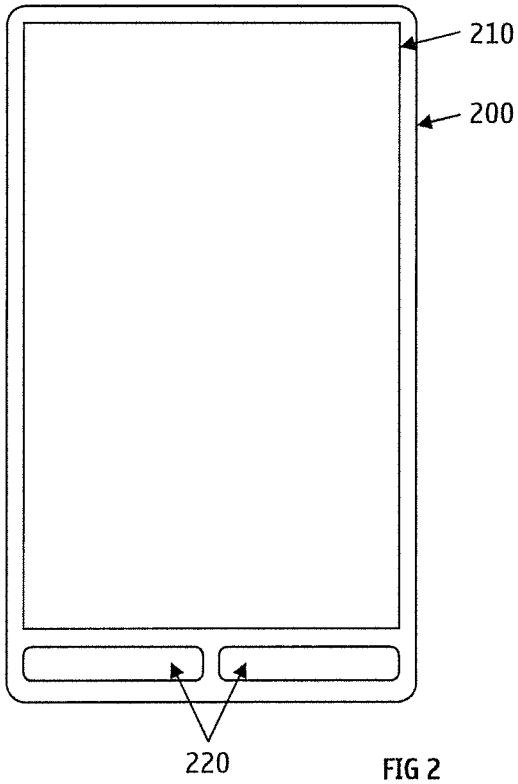
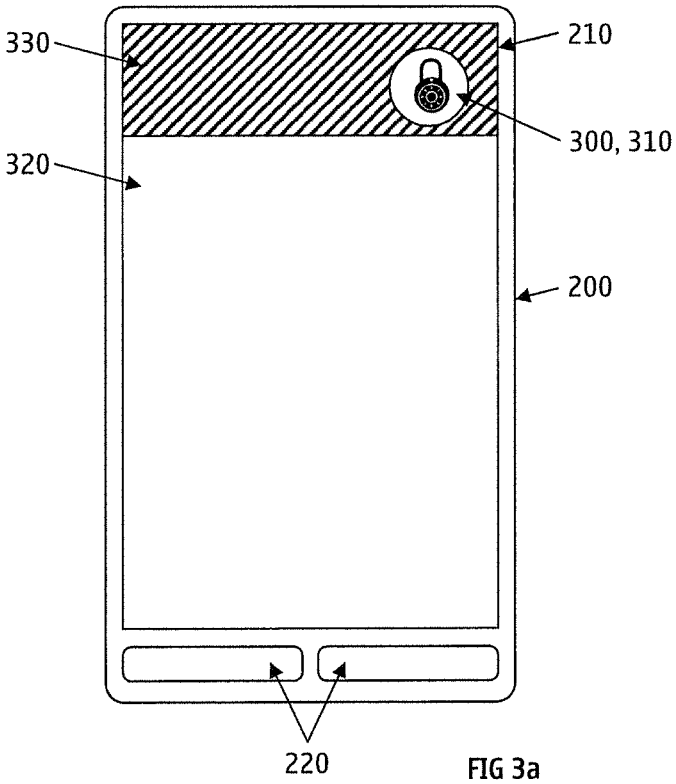


FIG 2



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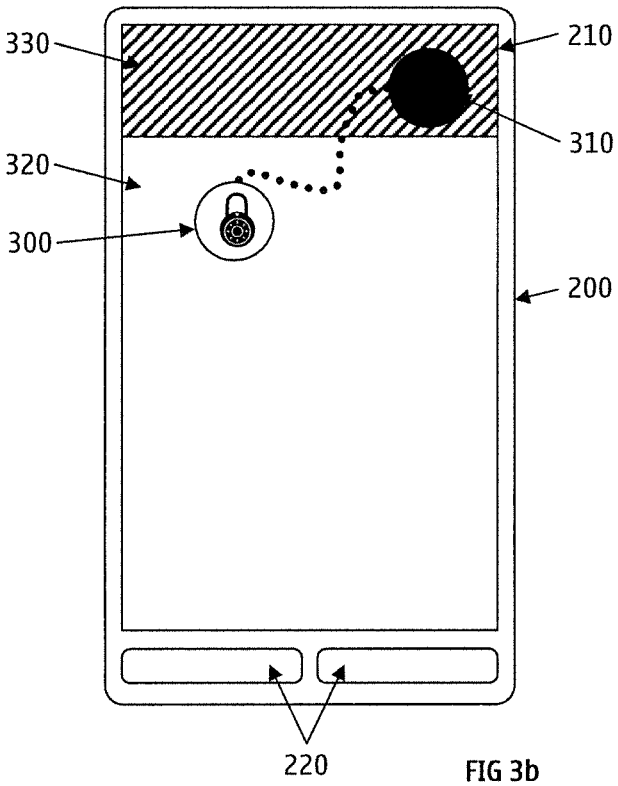


FIG 3b

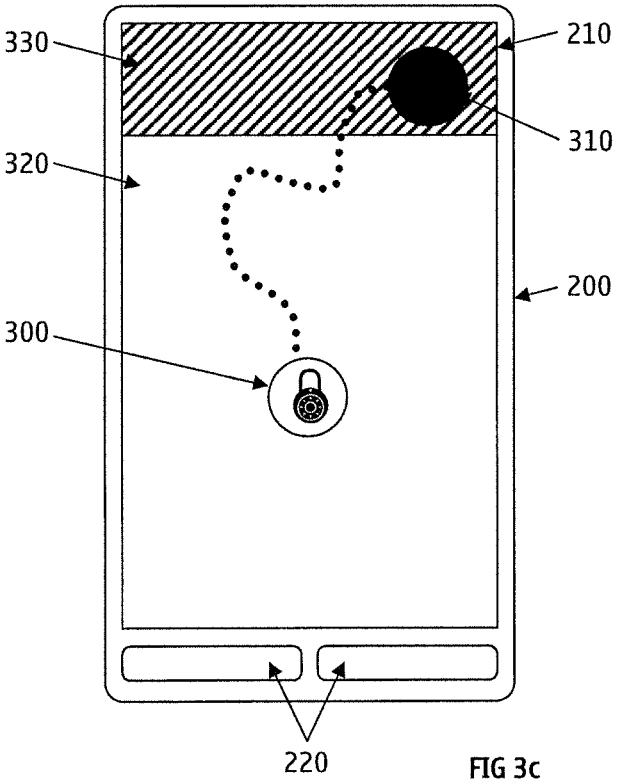
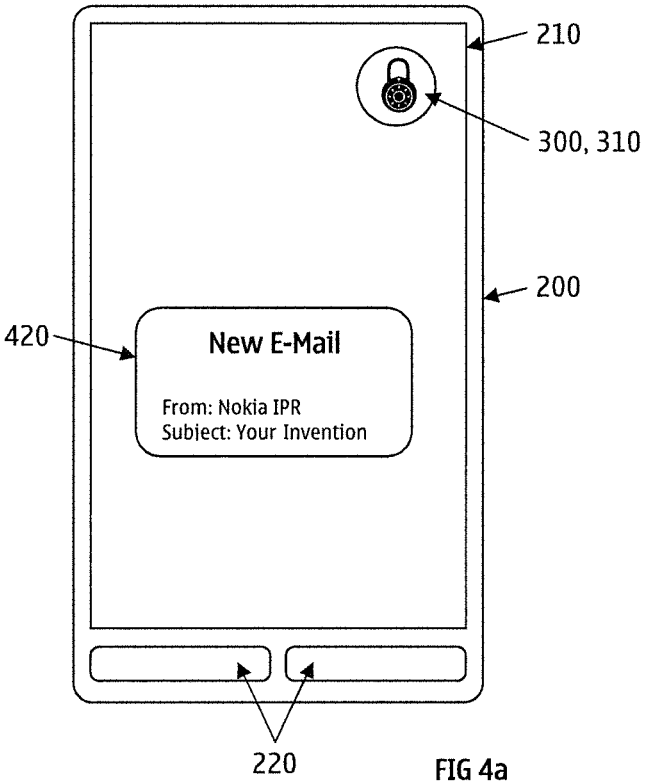


FIG 3c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200
420
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From: Nokia IPR
Subject: Your Invention
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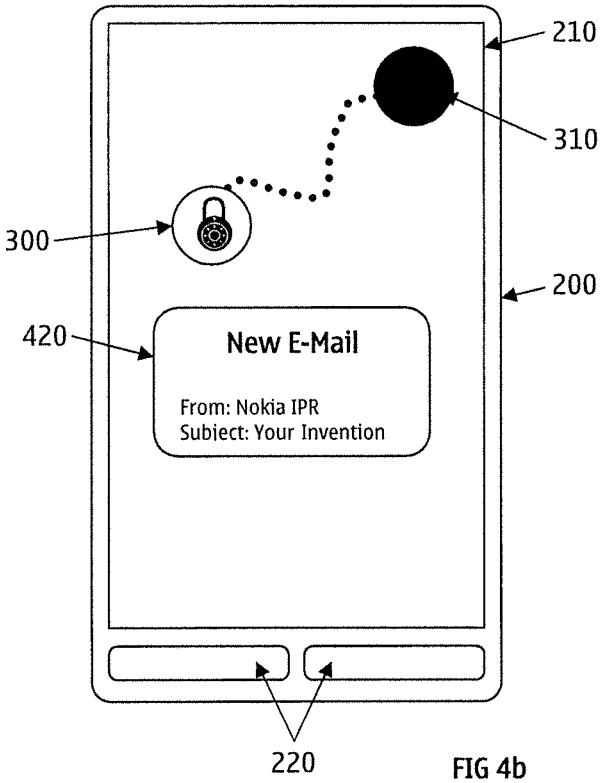
FIG 4a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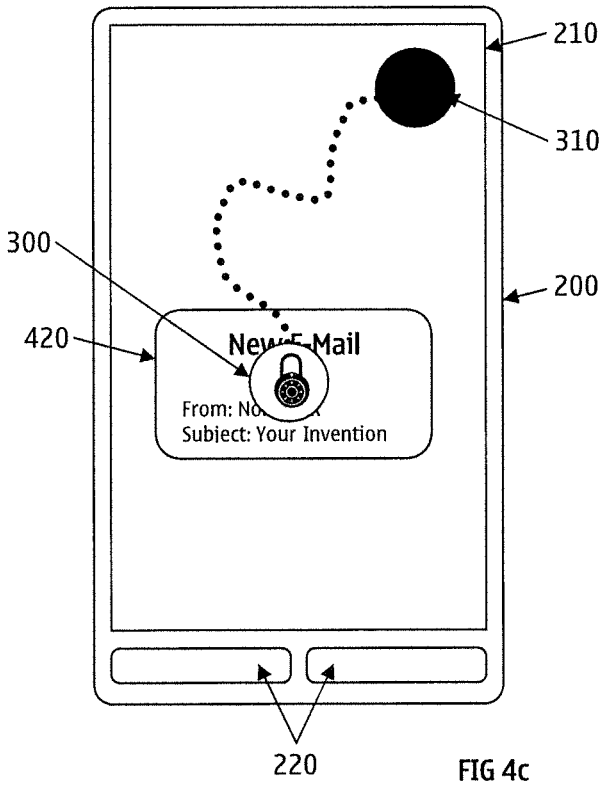
300
200
420
New E-Mail
From: Nokia IPR
Subject: Your Invention
220

FIG 4b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310
300
200
420
New E-Mail
From: No
Subject: Your Invention
220

FIG 4c

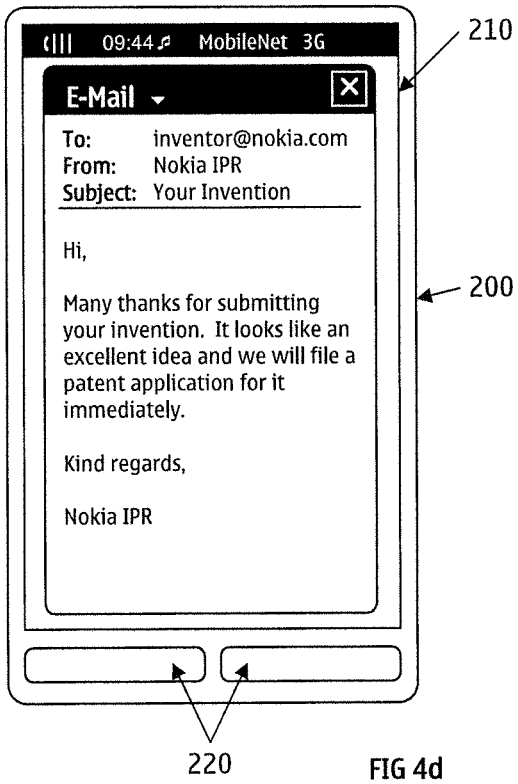
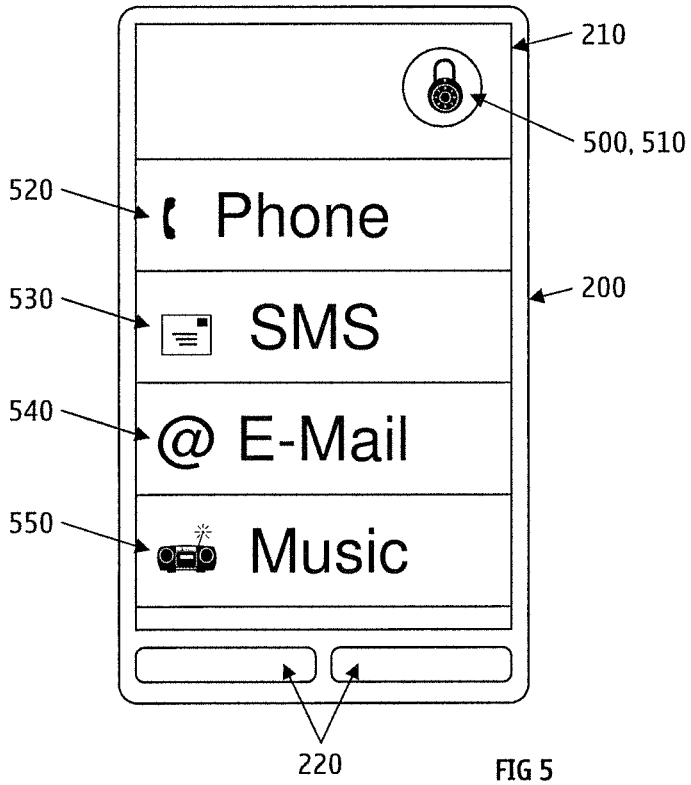

09:44
MobileNet 3G
E-Mail
To: inventor@nokia.com
From: Nokia IPR
Subject: Your Invention
Hi,
Many thanks for submitting your invention. It looks like an excellent idea and we will file a patent application for it immediately.
Kind regards,
Nokia IPR
210
200
220

FIG 4d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500, 510
520
Phone
530
SMS
200
540
@ E-Mail
550
Music
220

FIG 5

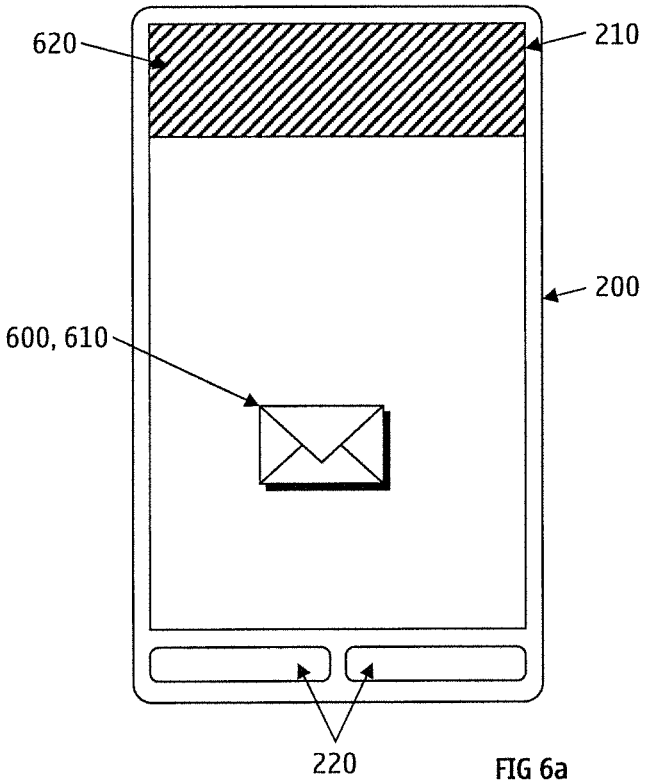

620
210
200
600, 610
220

FIG 6a

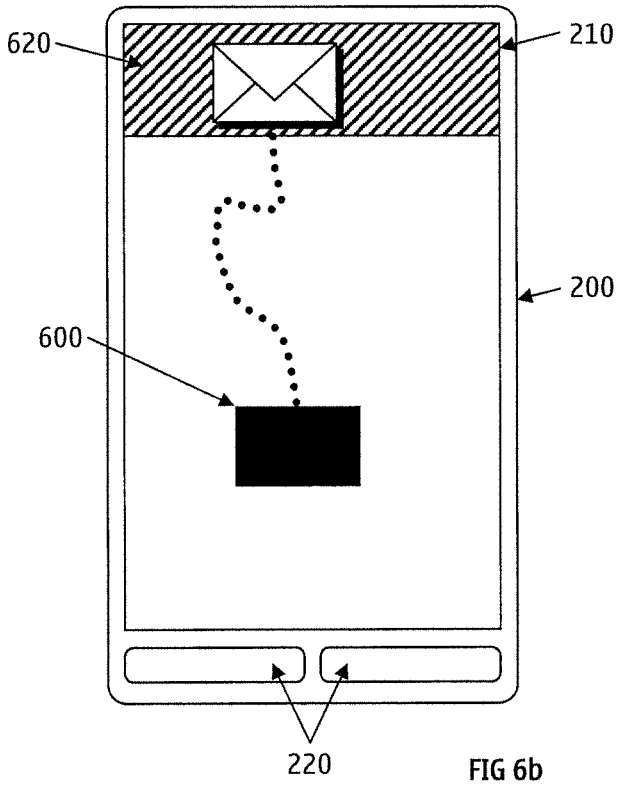

620
210
200
600
220

FIG 6b

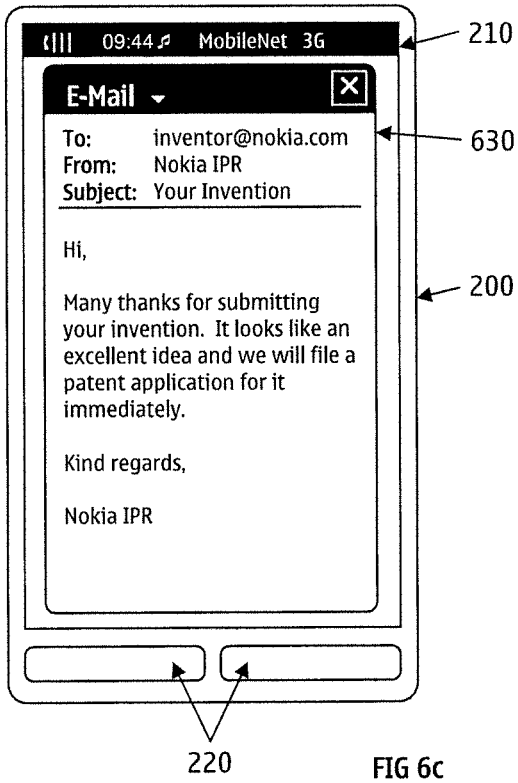

09:44
MobileNet 3G
210
E-Mail
To: inventor@nokia.com
From: Nokia IPR
Subject: Your Invention
630
Hi,
Many thanks for submitting your invention. It looks like an excellent idea and we will file a patent application for it immediately.
Kind regards,
Nokia IPR
200
220

FIG 6c

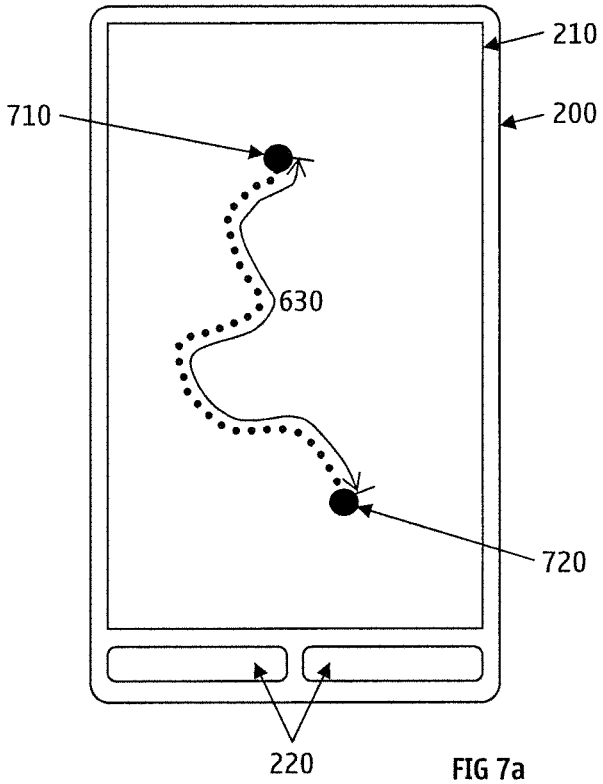


FIG 7a

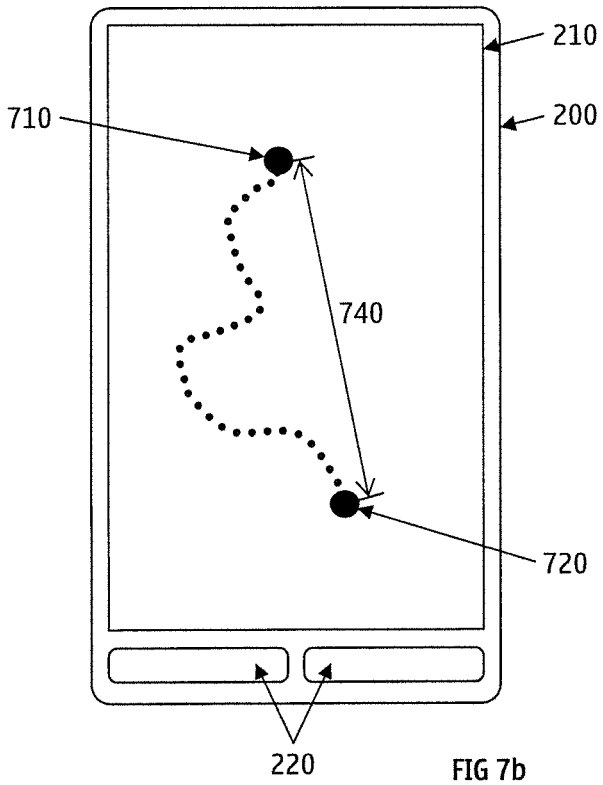


FIG 7b

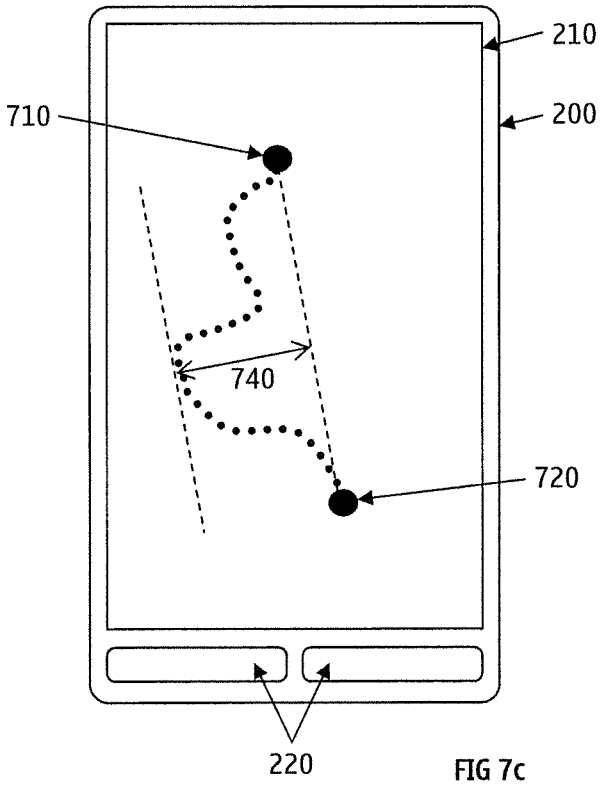


FIG 7c

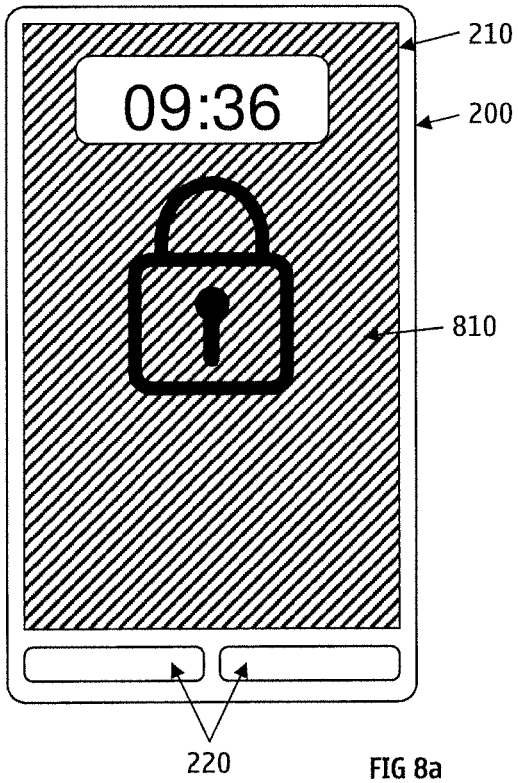
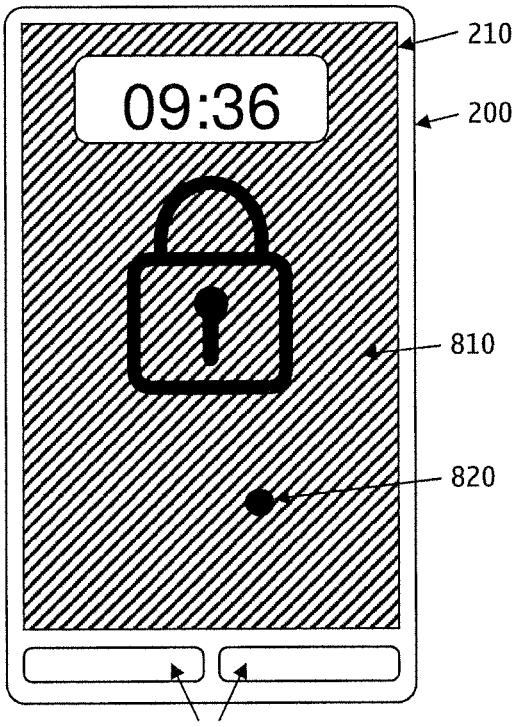


FIG 8a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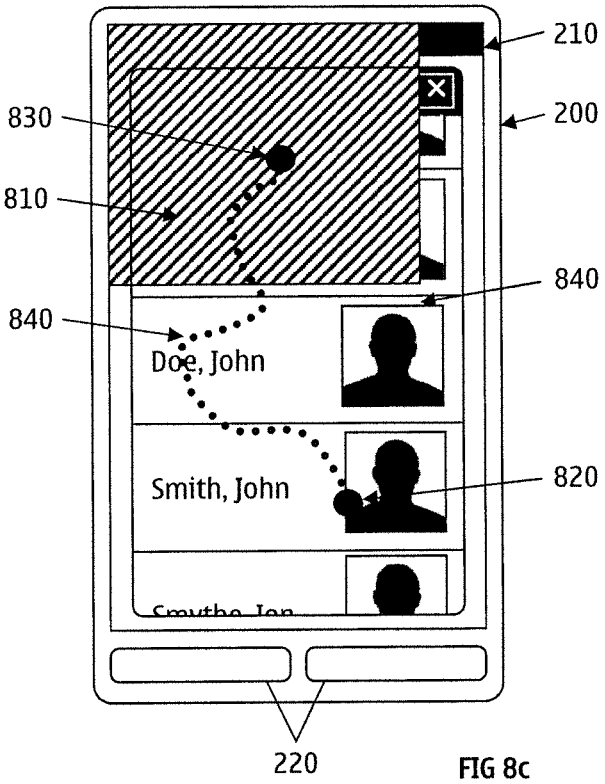
200
810
820

FIG 8b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200
830
810
840
840
Doe, John
Smith, John
820
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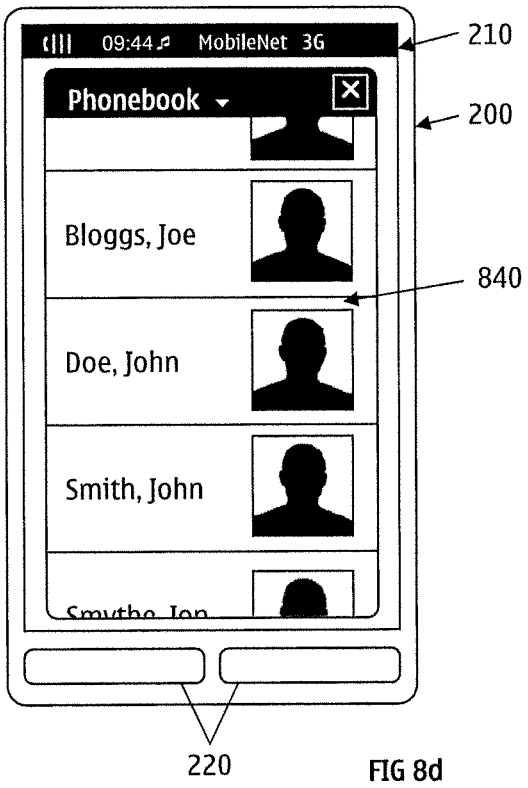
FIG 8c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MobileNet 3G
Phonebook
Bloggs, Joe
Doe, John
Smith, John
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200
840
220

FIG 8d

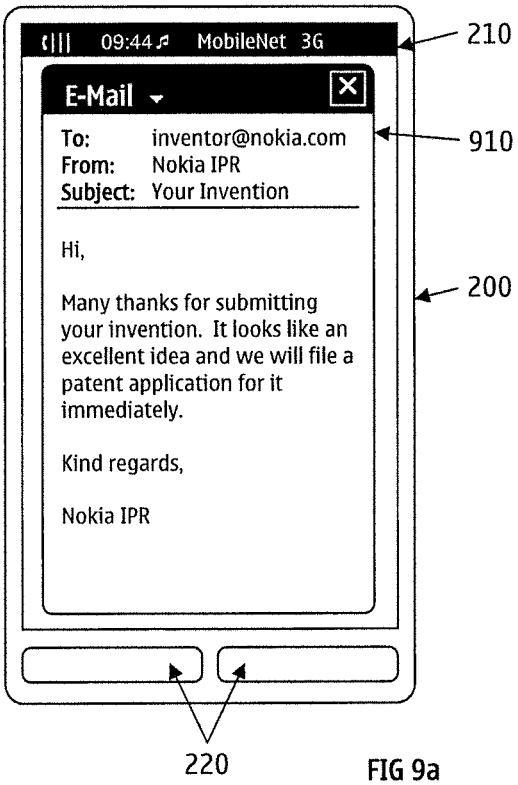
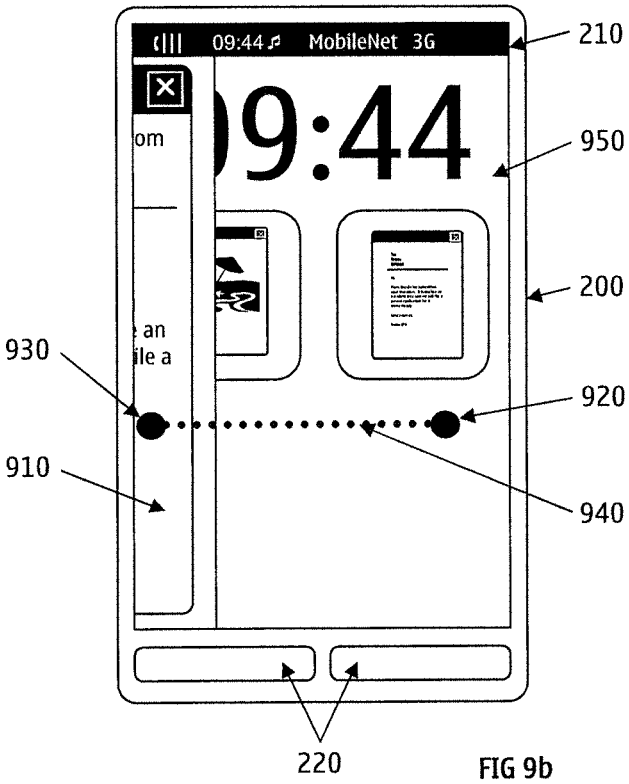

09:44 MobileNet 3G
E-Mail
To: inventor@nokia.com
From: Nokia IPR
Subject: Your Invention
Hi,
Many thanks for submitting your invention. It looks like an excellent idea and we will file a patent application for it immediately.
Kind regards,
Nokia IPR
210
910
200
220

FIG 9a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09:44
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950
200
930
920
910
940
220

FIG 9b

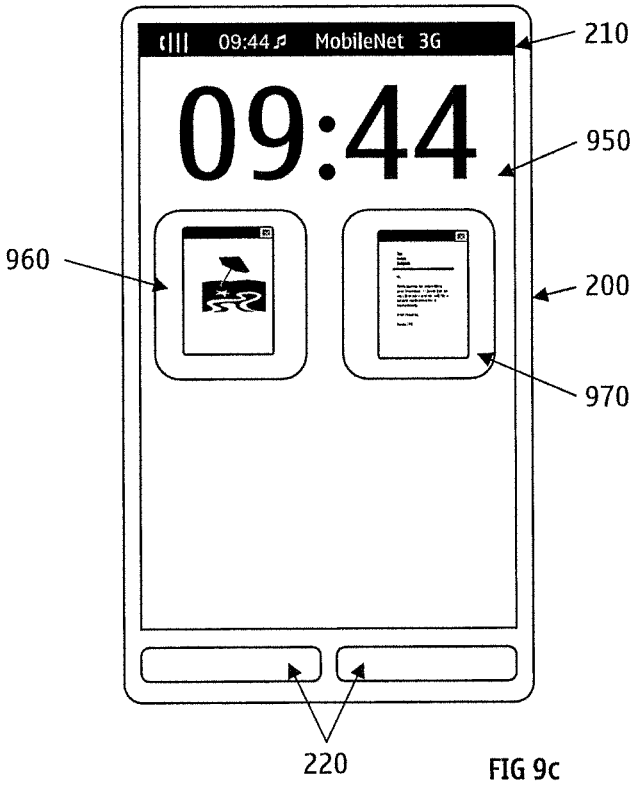

FIG 9c

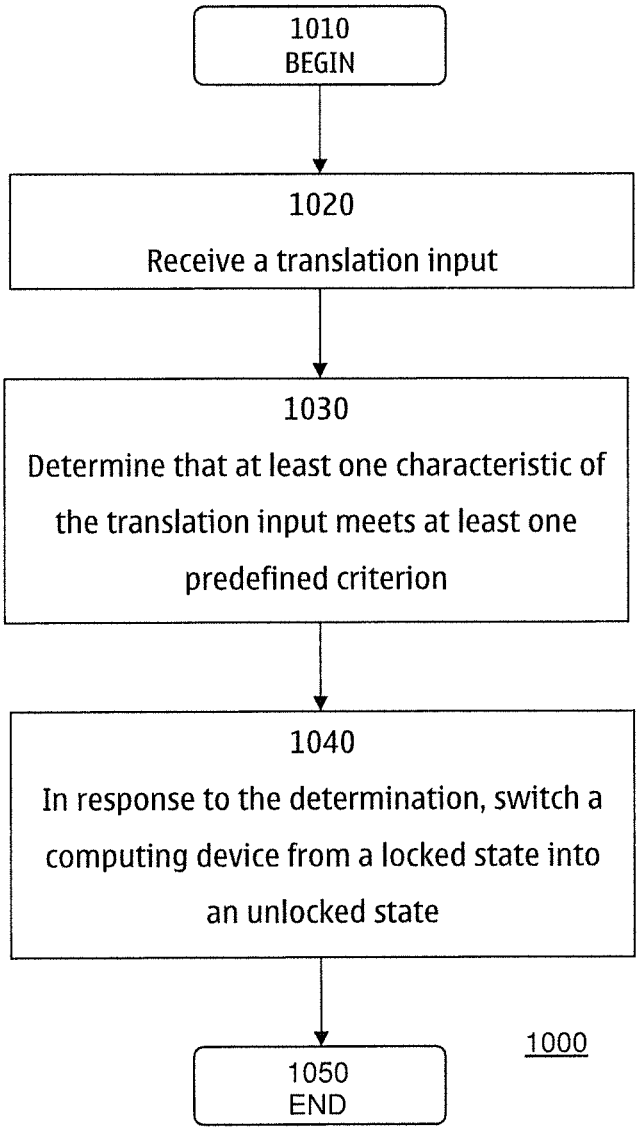
1010
BEGIN
1020
Receive a translation input
1030
Determine that at least one characteristic of the translation input meets at least one predefined criterion
1040
In response to the determination, switch a computing device from a locked state into an unlocked state
1050
END
1000

FIG. 10

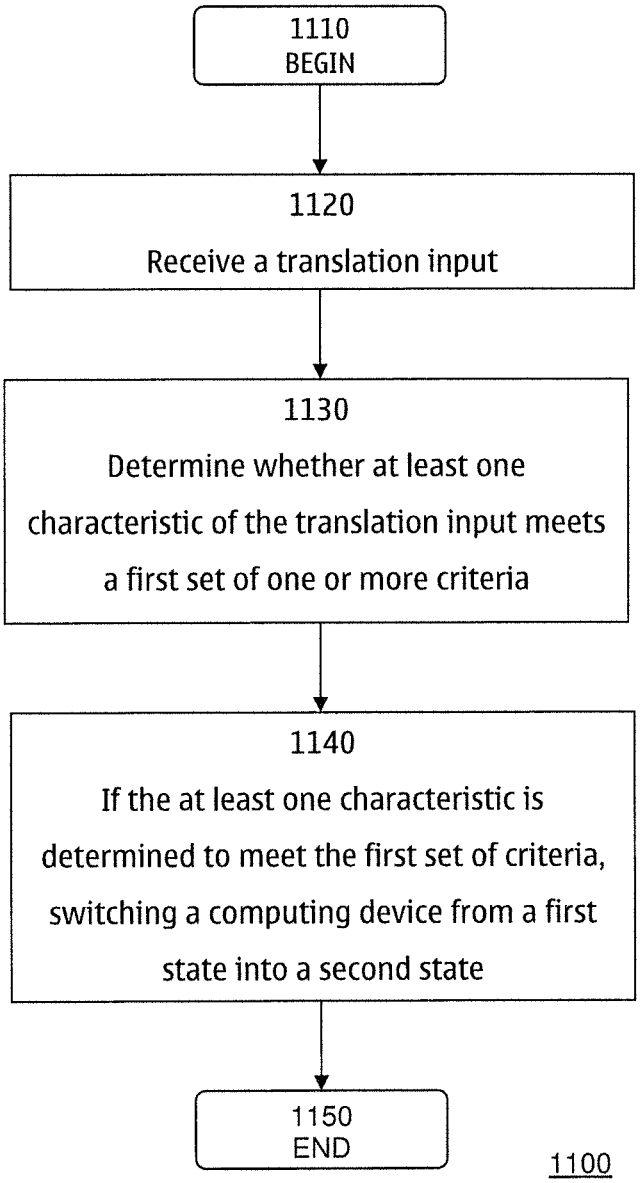
1110
BEGIN
1120
Receive a translation input
1130
Determine whether at least one characteristic of the translation input meets a first set of one or more criteria
1140
If the at least one characteristic is determined to meet the first set of criteria, switching a computing device from a first state into a second state
1150
END
1100

FIG. 11

MODE SWITCHING

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of and claims priority to U.S. application Ser. No. 12/874,206, filed Sep. 1, 2010, the entire contents of which are hereby incorporated by reference.

TECHNICAL FIELD

The present application relates generally to a method, apparatus, and computer program product for switching a device between states based upon the characteristics of a received translation input.

BACKGROUND

Some electronic devices are switchable between different operating states, for example a locked state in which certain functions are disabled, and an unlocked state in which those functions are enabled. Such switching may controlled by a user interface.

SUMMARY

According to a first example, there is provided a method comprising: receiving a translation input; determining that at least one characteristic of the translation input meets at least one predefined criterion; and in response to the determination, switching a computing device from a locked state into an unlocked state.

According to a second example, there is provided apparatus comprising: a processor; and memory including computer program code, the memory and the computer program code configured to, working with the processor, cause the apparatus to perform at least the following: receive a translation input; determine that at least one characteristic of the translation input meets at least one predefined criterion; and switch a computing device from a locked state into an unlocked state in response to the determination.

According to a third example, there is provided a computer program product comprising a computer-readable medium bearing computer program code embodied therein for use with a computer, the computer program code comprising: code for receiving a translation input; code for determining that at least one characteristic of the translation input meets at least one predefined criterion; and code for switching a computing device from a locked state into an unlocked state in response to the determination.

According to a fourth example, there is provided apparatus comprising: means for receiving a translation input; means for determining that at least one characteristic of the translation input meets at least one predefined criterion; and means for, in response to the determination, switching a computing device from a locked state into an unlocked state.

According to a fifth example, there is provided a method comprising: receiving a translation input; determining whether at least one characteristic of the translation input meets a first set of one or more criteria; and if the at least one characteristic is determined to meet the first set of criteria, switching a computing device from a first state into a second state, wherein: in said first state an application is in focus and a first display relating to the application is displayed, and in said second state the application is not in focus.

According to a sixth example, there is provided apparatus comprising: a processor; and memory including computer program code, the memory and the computer program code configured to, working with the processor, cause the apparatus to perform at least the following: receiving a translation input; determine whether at least one characteristic of the translation input meets a first set of one or more criteria; and if the at least one characteristic is determined to meet the first set of criteria, switch a computing device from a first state into a second state, wherein: in said first state an application is in focus and a first display relating to the application is displayed, and in said second state the application is not in focus.

According to a seventh example, there is provided a computer program product comprising a computer-readable medium bearing computer program code embodied therein for use with a computer, the computer program code comprising: code for receiving a translation input; code for determining whether at least one characteristic of the translation input meets a first set of one or more criteria; and code for switching a computing device from a first state into a second state if the at least one characteristic is determined to meet the first set of criteria, wherein: in said first state an application is in focus and a first display relating to the application is displayed, and in said second state the application is not in focus.

According to an eighth example, there is provided apparatus comprising: means for receiving a translation input; means for determining whether at least one characteristic of the translation input meets a first set of one or more criteria; and means for, if the at least one characteristic is determined to meet the first set of criteria, switching a computing device from a first state into a second state, wherein: in said first state an application is in focus and a first display relating to the application is displayed, in said second state the application is not in focus.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of example embodiments of the present invention, reference is now made to the following description taken in connection with the accompanying drawings in which:

FIG. **1** is an illustration of an apparatus according to an example of the invention;

FIG. **2** is an illustration of a device according to an example of the invention;

FIG. **3***a-c* is an illustration of a device according to an example of the invention;

FIG. **4***a-d* is an illustration of a device according to further example of the invention;

FIG. **5** is an illustration of a device according to an example of the invention;

FIG. **6***a-c* is an illustration of a device according to an example of the invention;

FIG. **7***a-c* is an illustration of a device according to three further examples of the invention;

FIG. **8***a-d* is an illustration of a device according to an example of the invention;

FIG. **9***a-c* is an illustration of a device according to an example of the invention;

FIG. **10** is a flow chart illustrating a method according to an example of the invention; and

FIG. **11** is a flow chart illustrating a method according to another example of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Example embodiment of the present invention and their potential advantages are understood by referring to FIGS. **1** through **11** of the drawings.

FIG. **1** illustrates an apparatus **100** according to an example embodiment of the invention. The apparatus **100** may comprise at least one antenna **105** that may be communicatively coupled to a transmitter and/or receiver component **110**. The apparatus **100** may also comprise a volatile memory **115**, such as volatile Random Access Memory (RAM) that may include a cache area for the temporary storage of data. The apparatus **100** may also comprise other memory, for example, non-volatile memory **120**, which may be embedded and/or be removable. The non-volatile memory **120** may comprise an EEPROM, flash memory, or the like. The memories may store any of a number of pieces of information, and data—for example an operating system for controlling the device, application programs that can be run on the operating system, and user and/or system data. The apparatus may comprise a processor **125** that can use the stored information and data to implement one or more functions of the apparatus **100**, such as the functions described hereinafter. In some example embodiments, the processor **125** and at least one of volatile **115** or non-volatile **120** memory may be present in the fond of an Application Specific Integrated Circuit (ASIC), a Field Programmable Gate Array (FPGA), or any other application-specific component.

The apparatus **100** may comprise one or more User Identity Modules (UIMs) **130**. Each UIM **130** may comprise a memory device having a built-in processor. Each UIM **130** may comprise, for example, a subscriber identity module, a universal integrated circuit card, a universal subscriber identity module, a removable user identity module, and/or the like. Each UIM **130** may store information elements related to a subscriber, an operator, a user account, and/or the like. For example, a UIM **130** may store subscriber information, message information, contact information, security information, program information, and/or the like.

The apparatus **100** may comprise a number of user interface components. For example, a microphone **135** and an audio output device such as a speaker **140**. The apparatus **100** may comprise one or more hardware controls, for example a plurality of keys laid out in a keypad **145**. Such a keypad **145** may comprise numeric (for example, 0-9) keys, symbol keys (for example, #, *), alphabetic keys, and/or the like for operating the apparatus **100**. For example, the keypad **145** may comprise a conventional QWERTY (or local equivalent) keypad arrangement. The keypad may instead comprise a different layout, such as E.161 standard mapping recommended by the Telecommunication Standardization Sector (ITU-T). The keypad **145** may also comprise one or more soft keys with associated functions that may change depending on the input of the device. In addition, or alternatively, the apparatus **100** may comprise an interface device such as a joystick, trackball, or other user input component.

The apparatus **100** may comprise one or more display devices such as a screen **150**. The screen **150** may be a touchscreen, in which case it may be configured to receive input from a single point of contact, multiple points of contact, and/or the like. In such an example embodiment, the touchscreen may determine input based on position, motion, speed, contact area, and/or the like. Suitable touchscreens may involve those that employ resistive, capacitive, infrared, strain gauge, surface wave, optical imaging, dispersive signal technology, acoustic pulse recognition or other techniques, and to then provide signals indicative of the location and other parameters associated with the touch. A "touch" input may comprise any input that is detected by a touchscreen including touch events that involve actual physical contact and touch events that do not involve physical contact but that are otherwise detected by the touchscreen, such as a result of the proximity of the selection object to the touchscreen. The touchscreen may be controlled by the processor **125** to implement an on-screen keyboard.

The touchscreen and/or other user interface components of the apparatus **100** may be used to detect a translation input. A translation input is a user input having start and end locations with a displacement input between the two, define a translation. For example, a touch-drag between two points on a touchscreen or other touch-sensitive surface is a translation input, as would be a click-drag using a mouse or other pointing and selection device.

FIG. **2** illustrates a device **200** that is an example of the apparatus **100** of FIG. **1**. The device has a touch screen **210** and hardware buttons **220**, although different hardware features may be present. For example, instead of a touchscreen **210** the device **200** may have a non-touch display upon which a cursor can be presented, the cursor being movable by the user according to inputs received from the hardware buttons **220**, a trackball, a mouse, or any other suitable user interface component.

Device **200** may be switchable between locked and unlocked states. In the unlocked states one or more user inputs are registered by user input components of the device **200** (e.g. the touchscreen **210** and the buttons **220**) and in response to these user inputs the device performs functions that are associated with the inputs. Such actions might be, for example, launching a particular application, displaying a particular menu, or performing other UI navigation or data entry functions.

In the locked mode, the device is configured not to perform at least some of these functions in response to user inputs that would trigger them were the device in the unlocked mode. This may be achieved, for example, by registering user inputs at the user input components, but blocking the device from performing the associated functions. Alternatively, the user input components may be blocked from registering the user inputs when the device is in the locked mode—for example by deactivating the user input components. In some example embodiments a combination of approaches may be used—for example, deactivating only some user input components but blocking the performance of the functions associated with inputs registered by at least some the remaining user input components. In some example embodiments, extra functions are provided while the device is in the unlocked state, and these may be mapped to new user inputs or user inputs for which the unlocked-state functions have been blocked. For example, an extra function may be provided to switch the device **200** to the unlocked state in response to the registration of a particular user input whilst the device is in the locked state.

FIGS. **3***a*-**3***c* illustrate an example of a method of switching the device **200** of FIG. **2** from a locked state into an unlocked state. FIG. **3***a* illustrates an example of the device **200** in its locked state. The device is displaying an icon **300** that represents the locked state of the device. The icon **300** in the example is an image of a lock, but it may be a different image, text, or any other displayable representation. The icon **300** is displayed within a first locus **310** of the display **210**, the first locus in this case corresponding to the position and size of the icon **200**, although it could potentially be any area of the display **210**.

In some examples, the first locus **310** may be visually or otherwise distinguished from all or part of the rest of the display **210**—in this example it is distinguished by the presentation of the icon **300**. Other ways to distinguish the first locus **310** would be to draw it in a differentiating colour, or representing the extent of the first locus **310** using haptic

feedback. The first locus may be so distinguished whenever the device **200** is in the locked state, or only when certain other criteria are also met—for example when a translation input is detected starting within the first locus **310**.

FIG. **3***a* also illustrates a second locus **320**. In the illustrated example, the second locus **330** is remote from the first locus **310**, but the two loci may be contiguous. Similarly, there is illustrated a remaining area **330** that consists of the display area that forms neither part of the first locus **310** nor the second locus **320**—but in other examples the first and second loci **310** **320** together cover the whole display area. Either or both of the first and second loci **310** **320** may represent point locations (e.g. a single pixel of the display **210**) or two-dimensional (or other multi-dimensional) areas on the display **210**. In some examples, the second locus **320** may correspond to a periphery of the display **210**, so that a translation input is said to end at the second locus **320** when it leaves the display **210** by crossing its outer edge or coming within a predetermined range of its outer edge. The use of the periphery and other criteria in this manner may, in some embodiments, help the user interface to distinguish between translation inputs that are intended to change the state of the device, and translation inputs that merely correspond to e.g. panning actions within an application.

In FIG. **3***b* the user has dragged the icon **300** out of the first locus **310** and into the second locus **320**. The icon **300** may be dragged using a touch-drag input where a finger or other stylus is contacted with the display **210**, brought within a threshold distance of it, or otherwise acts upon the display **210** to commence the drag input, before being translated across the display **210**. The drag may end when stylus ceases to act upon the display. Alternatively, a cursor may be controlled by a mouse, trackball, trackpad, joystick, directional buttons, or other controlling means in order, and positioned over the icon **300** or at a predetermined position relative to the icon **300** and moved to perform the translation. In the latter case the drag could be initiated and terminated by pressing and releasing a selection button, or using another suitable user interface component. Other methods of controlling a translation input relative to the icon may be used, for example drags that are controlled using voice instructions, eye-tracking, and the like. In some examples, the translation input must be actively ended in the second locus **320** by the user (e.g. by the user lifting his finger in the case of a touchscreen drag), but in other examples it is enough that the translation enters or comes within a predetermined range of the second locus **320**.

In FIG. **3***c* the user has completed the drag of the icon **300** to a position within the second locus **210** and has terminated the drag, for example (in the case of a touch screen) by lifting his finger from the display **210**. The device determines that the user has dragged the icon **300** out of the first locus **310** and into the second locus **320** and in response to this determination the device is switched from its locked state to an unlocked state.

FIG. **3***a*-**3***c* illustrate an example embodiment where the unlocking of the device **200** is dependent upon dragging an icon **300** between a first locus **310** and a second locus **320**. However, it is not essential that an icon or other object is actually dragged. Instead, in some examples it is enough that a translation input (e.g. a swipe touch gesture, or the movement of a cursor) is determined from the first locus to the second locus. The icon **300** may, however, be used to provide visual feedback to the user during the gesture. Visual feedback may also/alternatively be provided by drawing a visual trail on the display **210**, illustrating the path of the translation input as it is moved.

In response to the start of the translation input, other visual indications may, in some examples, be made to the user. For example, user interface elements on the display **210** may move, change colour, or otherwise be emphasized to the user. A visual representation of the second locus may be emphasized, for example by changing its colours and/or by moving it into a convenient position to be designated as the termination point of the translation input. In examples where more than one second locus are provided, the second loci may be moved into an arrangement such as a pie menu for ready access by the user making the translation input.

In the example of FIG. **3***a*-*c*, the second locus corresponded to a predetermined area of the screen that did not necessarily have any associated function. FIGS. **4***a*-*d* illustrate another example where the second locus has a particular function associated with it.

FIG. **4***a* shows the device **200** displaying an item **420** which is an alert relating to a received e-mail message. In practice, such alert may relate to other events, such as the receipt of an SMS message, a missed call, a calendar event, and so on. Although the example of an alert is used in FIG. **4***a*-**4***d*, the item may in fact be another displayed element, such as a shortcut to an application or function on the device (e.g. a shortcut to a camera application or a particular website). Regardless of whether it is an alert, a shortcut, or something else entirely, the item has associated with it a function that can be performed by the device. The particular function will be dependent upon the particular item, but for example a shortcut to a website may be associated with the function of opening a browser window and loading that website, and a received message alert may be associated with the function of opening a messaging client and displaying that message.

FIGS. **4***b* and **4***c* illustrate the dragging of the lock icon **300** away from the first locus **310** and towards the item **420**. The second locus is defined relative to the location of the second item, in this example such that the two share the same position and size (although other arrangements are possible).

When it is determined that the end point of the drag is within the second locus, the device **200** responds by switching to its unlocked state and performing the function that is associated with the second locus. In the example of FIGS. **4***a*-**4***d* the associated function is launching the e-mail client and opening the newly received message, and FIG. **4***d* illustrates this.

Although only one item **420** with an associated function is illustrated in FIGS. **4***a*-*d*, more than one item may be present and the items may have different associated inputs. For example, where a message alert and a camera application shortcut are displayed, dragging the icon to the message alert may unlock the device **200** and cause the function of launching the messaging client and opening the message to be performed, while dragging the icon to the camera application shortcut may cause the device **200** to be unlocked and the function of launching the camera application to be performed. Dragging the icon over two or more items in a single translation input may in some example embodiments cause the device **200** to be unlocked and the functions associated with each of those items to be performed.

In some example embodiments, the device **200** is returned to its locked state as soon as the function associated with the item has been completed. In some other example embodiments, the function is associated with a particular application and the device **200** is returned to its locked state once the associated application has been closed (e.g. in the example where the item is a message alert associated with the function of launching a messaging client and opening a message, the device **200** may be returned to its locked state once the mes-

saging client is closed). In some other example embodiments, switching the device to an unlocked state comprises switching the device into a state in which only certain functions are unlocked—for example, in FIG. **4***d* the e-mail application window relating to the new message may be unlocked for user input, but other functions (e.g. the hardware keys **220** of the device) may remain locked.

In some examples, a plurality of second loci may be provided, with different second loci associated with different functions. For example, FIG. **5** illustrates a translation input can be started at a first locus **500** corresponding to an unlock icon, and end at one of a plurality of second loci **520**, **530**, **540**, **560**, different ones of the second loci being associated with different functions. In the example of FIG. **5**, the second loci are associated with launching a phone application, launching an SMS client, launching an e-mail client, and launching a music application, although other suitable functions may be associated with the loci.

As described in relation to FIGS. **3***a*-**3***c*, it is not necessarily the case that the translation input in FIGS. **4***a*-**4***d* is a drag input on an icon, or that the user actively ends the input within the second locus. Instead, other types of translation input may be used in other examples.

FIGS. **6***a*-*c* illustrate an example where rather than the user entering a translation input that ends at a locus associated with a particular function (e.g. launching an e-mail application), it is the locus of the start of the translation input that is associated with the function.

For example, FIG. **6***a* illustrates a device **200** in a locked state, on whose display **210** is displayed an e-mail notification **610** at a first locus **600** and an unlock area at a second locus **610**. The e-mail notification **600** is displayed in response to the reception of a new e-mail message.

In FIG. **6***b* a translation input has been received from the user between a location within the first locus **600**, corresponding to the original position of the e-mail notification **610**, and a location within the second locus (the unlock area) **620**. In response to this input the notification **610** has been translated to the location within the second locus **620**, providing visual feedback to the user.

In FIG. **6***c*, the user has terminated the translation input at the location within the second locus **620**, and in response the device has been switched to its unlocked state, the e-mail client **630** opened, and the new message represented by to the notification **610** has been automatically opened. This is the functionality that was associated with the first locus **610**, but only performed in response to the translation input from the first locus **610** to the second locus **620**.

FIG. **6***a*-*c* is a specific example of an implementation of a more general idea. As described above with respect to other examples, it is not necessary that a notification or other representation be displayed at the first locus **610**, or that the unlock area **620** is displayed at the second locus. Similarly, the function associated with the first locus need not be to open an e-mail message, if could be any other function relating to a received message and/or notification, or any other function that the device **200** can perform.

In some example embodiments, a plurality of first loci may be provided, each associated with a different function in an analogue of FIG. **5**.

In FIGS. **3***a*-**3***c*, and **4***a*-**4***d*, **5**, and **6***a*-*c* the device was switched between its locked and unlocked states in response to a translation input that started and ended within predefined loci; however, there are other ways in which a translation input can be recognised as a command to unlock the device. FIGS. **7***a*-*c* illustrates some of these different ways.

FIG. **7***a* illustrates a continuous translation input between a start point **710** and an end point **730**. The total length **730** along the path of the input is determined and the device **200** is unlocked only if the total length is greater than a threshold amount. The threshold amount may be predetermined, e.g. by the user or the device manufacturer, or it may be determined dynamically, for example as a function of the length of time that has passed since the device was last in its unlocked state. For example, it may be that a greater length of input is required to unlock the device when it has not locked for a long time (e.g. an hour), whereas a shorted length may be required when the device was unlocked recently (e.g. 10 seconds ago).

In FIG. **7***a*, it was the total length **730** of the translation input that was determined and compared to a threshold value—this total length being the full path of the input. FIG. **7***b* shows an example where the straight-line distance **740** between the start and end points **710**, **720** is measured and compared to a threshold instead of the total length **730**.

In some examples, the end point **720** is defined as the location at which the user actively terminates the translation operation (e.g. ceases to touch the display **210** in the example of a touch drag operation), but in other examples the end point **720** may be a current end point of an ongoing translation input. For example, as the translation input is entered, the distance of the current end point may extend briefly beyond the threshold value from the start point, but then return within it before the translation input terminates. In this example where the distance between the start and current end points is used, the device **200** will switch to its unlocked state when the threshold value is exceeded. However, in the example where the end point **720** is taken to be the location at which the translation input is terminated, the device **200** will remain in the locked state because the distance between the start point **710** and this end point **720** is less than the threshold value.

FIG. **7***c* illustrates yet another example, in which it is the maximum deviation **740** of a translation input from a straight line path between its start point **710** and end point **720** that is measured. Again, the end point that defines the path may be the current end point, or the end point at which the user terminates the translation input.

In one example, the device **200** is unlocked only if the maximum deviation **740** is less than a threshold value. In another example, the device **200** is unlocked only if the maximum deviation is greater than a threshold value. In other examples, the device **200** is unlocked only if the maximum deviation **740** lies within a particular range of values.

It is possible to measure other characteristics of a translation input in order to determine whether or not the device **200** should be unlocked. Suitable characteristics may include, but are not limited to: the pressure applied to a touch sensitive surface (e.g. a touchscreen) during the translation input; the distance of an object from a touch sensitive surface during the translation input; and the minimum, average, or maximum speeds of the translation input. The device may be unlocked if a selected one or more characteristic is measured to be less than a threshold value, greater than a threshold value, or within a continuous or discontinuous range of values. Similarly the device may be unlocked if a function of one or more measurements of one or more characteristics is determined to be less than a threshold value, greater than a threshold value, or within a continuous or discontinuous range of values. Suitable functions may include mean and other averaging functions.

In some examples, the device **200** may only switch to its unlocked state in the event that more than one of the above conditions are satisfied. For example, it may be required that a translation input has a total path length **730** greater than a

first threshold value, in combination with a maximum deviation of less than a second threshold value.

FIGS. **8***a-d* illustrate an example of the device **200** in which the first locus comprises the entire display **210**, or at least a substantially all of the display **210** (e.g. there may be a small status bar or the like that is not within the first locus). A lock screen **810** is displayed on the display, the lock screen **810** indicating to the user that the device **200** is in a locked state. In some further examples, the lock screen **810** may include portions of the display that are deactivated or otherwise placed in a low-power state (e.g. not backlit) in order to conserve power whilst the device **200** is in the locked state.

In FIG. **8***b* the user has begun a translation input at a location **820** within the first locus (i.e. substantially anywhere on the display **210**).

In FIG. **8***c* the user has continued the translation input to location **840**, along path **840**. As the input moves along the path **840**, at least a portion of the lock screen **810** has been translated along the path, revealing a content screen **840** beneath it. Although the content screen may contain content with which the user can interact (e.g. virtual buttons and other user interface components), such interaction may be disabled until such time as the device **200** is switched to its unlocked state.

When the translation input is terminated, a decision is made as based on the input as to whether or not the device **200** should be switched from its locked state into an unlocked state. The decision may be based, for example, on the location of the end of the translation input (e.g. is it within a second locus located at a periphery of the display) and/or a determination that the path **840** exceeds a threshold length.

In the event that the device **200** is to be switched to its unlocked state, any remaining visible portion of the lock screen **810** is removed from the display **210**, as shown in FIG. **8***d*. User interaction with the content of the content screen **840** may be enabled.

Conversely, if the decision is made to maintain the device **200** in its locked state, the lock screen **810** may be returned to its original location covering the content screen **840**, as shown in FIG. **8***a*, and the device **200** is not switched to its unlocked state.

Example embodiments have been described in which a device is switched, based on the characteristics of a translation input, between locked and unlocked states. However, devices may be switched between other states based upon the characteristics of a translation input.

FIGS. **9***a-c* illustrate an example in which the characteristics of a translation input determine the switching of a device **200** between a first and second state. In the first state, shown by FIG. **9***a*, an e-mail application is in focus, an e-mail display **910** associated with the e-mail application filling substantially all of the area of the device's display **210**. Although an e-mail application is illustrated, other types of application or any other software component presenting a user interface or other content on the display **210** may be selected. Similarly, the display of the application or other component fills all, substantially all, or only part of the device's display area.

In FIG. **9***b*, the user has initiated a translation input at location **920**, for example by touching the display **200** at this location. The translation input is then continued to location **930**, along path **940**, for example by dragging the finger across the display to location **930**.

As the translation input is extended along path **940**, the e-mail display **910** may be translated along the same path. Such a translation is shown in FIG. **9***c*. As the e-mail display **910** is translated, it reveals an idle screen display **950** beneath it.

An idle screen, sometimes known as a "home screen" is a display that provides a root navigation level within a device's user interface. It may, for example, be displayed when no applications are running, or when no applications are currently in focus. Because of the root nature of the home screen, it is commonly used to display the current time, upcoming calendar events, event notifications, and other information relating to the device and/or its content. An idle screen, or a home screen, may also be referred to by the more general term "root navigation display". A root navigation display is a display that lies at the root of a navigation session—in other words, other displays may be closed/hidden to work backwards to the root navigation display, but there is no further scope to navigate backwards from the root navigation display. The root navigation display may be thought of as residing at the most fundamental level in a tree structure of potential displays.

Although an idle screen has been selected for the purposes of illustration, other function may be selected in practice. For example, the idle screen may be replaced by a task manager, a main menu (i.e. a menu from which applications may be launched), or any other suitable display.

Based on the characteristics of the translation input, it is determined whether the device is to be switched from its first state (in which the e-mail application is in focus) into a second state. In the second state, the idle screen (or other suitable function) is in focus, and the e-mail application is out of focus and in some example embodiments is terminated. Suitable characteristics are described above, in relation to the other examples.

If it is determined that the device **200** is not to be switched from the first state into the second state, the e-mail display **910** is returned to cover the idle screen display **1010** (as shown in FIG. **9***a*) and the e-mail application remains in focus.

However, if it is determined that the device is to be switched from the first state into the second state, then any remaining visible portion of the e-mail display **1010** is removed from the display **210**, and the idle screen display **950** replaces it. Any components in the idle screen display **950** that are capable of user interaction may be enabled in response to the switch to the second state. This is illustrated in FIG. **9***c*.

The example idle screen display **950** of FIG. **9***c* includes user-selectable representations **960**, **970** of applications that are running on the device but are not currently in focus. These include a representation **970** of the e-mail application that was in focus in the first state. A suitable representation may be based upon a screenshot of the e-mail display **910** immediately prior to its loss of focus, or a live representation of the e-mail display **910** (i.e. a representation that continues to be updated as the e-mail display **010** would be, were it in focus).

In an example embodiment a selectable representation is based on information other than a screenshot of a represented application. For example, there may be a subset of information associated with the application that may allow a user to recognize the application. For example, a selectable representation of an instant message conversation may be based on information associated with a participant of the conversation, such as a name, and image, and/or the like, a representation of the last message of the conversation, and/or the like. In such an example, information associated with the instant message conversation may be omitted from the selectable representation, such as previous messages, controls, and/or the like. In another example, a selectable representation of a telephony application may be based on information associated with a participant in a call, such as an image, name, and/or the like,

a call duration indicator, and/or the like. In such an example, information associated with the telephony application may be omitted from the selectable representation, such as controls, keypad indications, and/or the like. Without limiting the scope of the claims in any way, at least one possible technical advantage of basing the selectable representation on a subset of application information is reducing the amount of information comprised in a selectable representation.

In an example embodiment, the device generates the selectable representation based on a subset of information so that at least part of the information associated with the represented application is omitted from the selectable representation. The device may generate the selectable representation based on a determination of which subset of information may allow a user to recognise the application. The determination of the subset of information may be performed by the device based on at least one characteristic of the application. For example, the device may determine the subset of information based, at least in part, on a type associated with the application. For example, the device may determine that the subset of information for a selectable representation of a messaging application should include participant information and information associated with the most recent message. In another example, the subset of information may be pre-determined. In such an example, the subset of information may be determined by a setting, by programming, by a table, and/or the like.

In response to a user selection of the representation **1070** of the e-mail application, the focus may be restored to the e-mail application by switching the device **200** from the second state back to the first state.

In example embodiments where switching from the first to second state terminates the application in focus in the first state, the representations **960**, **970** in the idle screen display **950** may include a representation of the terminated application. Selecting the representation of the terminated application in such cases may cause the application to be re-launched. In some further example embodiments, the application may be re-launched with the same context that it had when it was terminated, effectively returning the device **200** back to its first state.

In some examples performing a translation input when the device is already in the second state may cause the device to re-enter the first state, or to switch to a different state entirely.

In further examples, different characteristics of the translation input may cause the device to be switched into different states in which another display is presented on the display. The other display may relate to a settings menu, an alternative idle screen, a main menu, a different root navigation display, a messaging or other application, or any other suitable function of the device. For example, a translation input in a first direction may cause a display relating to a second state to be uncovered and the device to be switched to the second state, whilst a translation input in a second direction causes a display relating to a third state to be uncovered and the device switched to that third state. In some examples, a translation input in a particular direction may cause a predetermined application to be launched, or function to be performed. For example, a drag gesture towards the top of the display may cause the device to launch an e-mail application, whereas a drag towards the right hand side of the display may cause the device to be placed in a silent mode.

If the device is already displaying a root navigation display (for example an idle or home screen) when the translation input is received, the device may be switched to a state that is associated with a different root navigation display. This switching may be circular so that if the translation input is repeated a sufficient number of times then the state of the device eventually returns to the originally displayed root navigation display. Such functionality may find application in examples where the device is configured to present more than one homescreen, amongst others examples.

In examples where the device is configured to present multiple root navigation displays and the translation input has the effect of switching the device from an application to one of these root navigation displays, the choice of root navigation display (and therefore of the second state) may be determined to be the root navigation state from which the application was directly launched (e.g. by selecting an option associated with the application in the root navigation display). Where the application has not been directly launched from a root navigation display but instead from another application (e.g. where a web browser has been launched by selecting a hyperlink embedded in a message displayed by an e-mail application) then the second state may be determined to be the state in which that other application is running, or the the root navigation display from which the other application was itself launched (either directly, or via a chain of other applications).

Similarly, where multiple root navigation displays are available, switching from a state in which an application is running need not necessarily involve switching to a the root navigation display from which that application was launched. Instead, the switch may be to a different root navigation display (e.g. the most recent root navigation display to be displayed by the device).

FIG. **10** illustrates an example method **1000** for implementing functionality described above. On beginning **1010** the method starts with the reception **1020** of a translation input, for example a drag operation on a touch screen. The method then determines **1030** that a at least one characteristic of the translation input, for example the length of the input or the location of its start and end points, meets at least one predefined criterion, and in response to that determination a computing device is switched **1040** from a locked state into an unlocked state. The method then ends **1050**.

FIG. **11** illustrates another example method **1100** for implementing functionality described above. On beginning **1110**, the method starts with the reception **1120** of a translation input. It is then determined **1130** whether at least one characteristic of the translation input meets a first set of one or more criteria. If the at least one characteristic is determined to meet the first set of criteria, a computing device is switched **1240** from a first state into a second state. In the first state an application is in focus and a first display relating to the application is displayed, whereas in the second state the application is not in focus and a second display is displayed. The method then ends **1150**.

Without in any way limiting the scope, interpretation, or application of the claims appearing below, a technical effect of one or more of the example embodiments disclosed herein is that an improved user experience is provided, in which fewer user input actions are required to complete operations.

Example embodiments of the present invention may be implemented in software, hardware, application logic or a combination of software, hardware and application logic. The software, application logic and/or hardware may reside on a removable memory, within internal memory or on a communication server. In an example embodiment, the application logic, software or an instruction set is maintained on any one of various conventional computer-readable media. In the context of this document, a "computer-readable medium" may be any media or means that can contain, store, communicate, propagate or transport the instructions for use by or in con-

nection with an instruction execution system, apparatus, or device, such as a computer, with examples of a computer described and depicted in FIG. **1**. A computer-readable medium may comprise a computer-readable storage medium that may be any media or means that can contain or store the instructions for use by or in connection with an instruction execution system, apparatus, or device, such as a computer.

In some example embodiments, the invention may be implemented as an apparatus or device, for example a mobile communication device (e.g. a mobile telephone), a PDA, a computer or other computing device, or a video game console.

If desired, the different functions discussed herein may be performed in a different order and/or concurrently with each other. Furthermore, if desired, one or more of the above-described functions may be optional or may be combined.

Although various aspects of the invention are set out in the independent claims, other aspects of the invention comprise other combinations of features from the described example embodiments and/or the dependent claims with the features of the independent claims, and not solely the combinations explicitly set out in the claims.

It is also noted herein that while the above describes example embodiments of the invention, these descriptions should not be viewed in a limiting sense. Rather, there are several variations and modifications which may be made without departing from the scope of the present invention as defined in the appended claims.

What is claimed is:

1. Apparatus comprising:

at least one processor; and

memory including computer program code configured to, working with the at least one processor, cause the apparatus to perform at least the following:

causing a computing device, having a locked state in which a lock screen is displayed on a touch sensitive display and unlocked states, to launch an application and to display on the touch sensitive display a first display screen in which the application is in focus, in response to input registered by the touch sensitive display when the computing device is in an unlocked state, the application substantially filling the touch sensitive display; and

causing, as a user provides a translation input across the touch sensitive display that is initiated while the application is in focus on the touch sensitive display, removal of the first display screen from the touch sensitive display with the translation input, wherein the translation input includes a touch input at a first location on the touch sensitive display that is continued to a second location on the touch sensitive display along a path, wherein at least one characteristic of the translation input meets a set of criteria corresponding to a length of the input, a direction of the input or relative locations of the first location and the second location on the touch sensitive display, and in response to a determination that the at least one characteristic of the translation input meets the set of criteria, the removal of the first display screen from the touch sensitive display reveals a second display screen which appears from beneath the first display screen and in which the application is not in focus,

wherein a selectable representation of the application is displayed in the second display screen.

2. The apparatus of claim **1**, wherein the second display screen is a root navigation screen.

3. The apparatus of claim **1**, wherein the second display screen comprises a plurality of user selectable representations of applications currently running on the apparatus.

4. The apparatus of claim **3**, wherein the computer program code is configured to, working with the at least one processor, cause the apparatus to further perform: terminating the application in response to the translation input provided to remove the first display screen from the touch sensitive display.

5. The apparatus of claim **1**, wherein at least part of the information that was displayed in the first display screen is not present in the selectable representation.

6. The apparatus of claim **1**, wherein the first display screen is removed by translating the first display screen across the touch sensitive display with the translation input.

7. Apparatus comprising:

at least one processor; and

memory including computer program code configured to, working with the at least one processor, cause the apparatus to perform at least the following:

causing a computing device, having a locked state in which a lock screen is displayed on a touch sensitive display and unlocked states, to launch an application and to display on the touch sensitive display a first display screen in which the application is in focus, in response to input registered by the touch sensitive display when the computing device is in an unlocked state, the application substantially filling the touch sensitive display;

causing, as a user provides a translation input across the touch sensitive display that is initiated while the application is in focus on the touch sensitive display, removal of the first display screen from the touch sensitive display with the translation input, wherein the translation input includes a touch input at a first location on the touch sensitive display that is continued to a second location on the touch sensitive display along a path, wherein at least one characteristic of the translation input meets a set of criteria corresponding to a length of the input, a direction of the input or relative locations of the first location and the second location on the touch sensitive display, and in response to a determination that the at least one characteristic of the translation input meets the set of criteria, the removal of the first display screen from the touch sensitive display reveals a second display screen which appears from beneath the first display screen and in which the application is not in focus,

wherein a selectable representation of the application is displayed in the second display screen; and

terminating the application in response to the translation input provided to remove the first display screen from the touch sensitive display.

8. The apparatus of claim **7**, wherein the first display screen substantially fills the touch sensitive display prior to the translation input being provided by the user.

9. The apparatus of claim **7**, wherein the second display screen is a root navigation screen.

10. The apparatus of claim **7**, wherein the second display screen comprises a plurality of user selectable representations of applications currently running on the apparatus.

11. The apparatus of claim **7**, wherein at least part of the information that was displayed in the first display screen is not present in the selectable representation.

12. The apparatus of claim **7**, wherein the first display screen is removed by translating the first display screen across the touch sensitive display with the translation input.

13. The apparatus of claim **1**, wherein the apparatus is the computing device.

14. The apparatus of claim **7**, wherein the apparatus is the computing device.

15. A method, comprising:

causing a computing device, having a locked state in which a lock screen is displayed on a touch sensitive display and unlocked states, to launch an application and to display on the touch sensitive display a first display screen in which the application is in focus, in response to input registered by the touch sensitive display when the computing device is in an unlocked state, the application substantially filling the touch sensitive display; and

causing, as a user provides a translation input across the touch sensitive display that is initiated while the application is in focus on the touch sensitive display, removal of the first display screen from the touch sensitive display with the translation input, wherein the translation input includes a touch input at a first location on the touch sensitive display that is continued to a second location on the touch sensitive display along a path, wherein at least one characteristic of the translation input meets a set of criteria corresponding to a length of the input, a direction of the input or relative locations of the first location and the second location on the touch sensitive display, and in response to a determination that the at least one characteristic of the translation input meets the set of criteria, the removal of the first display screen from the touch sensitive display reveals a second display screen which appears from beneath the first display screen and in which the application is not in focus, wherein a selectable representation of the application is displayed in the second display screen.

16. The method of claim 15, wherein the first display screen is removed by translating the first display screen across the touch sensitive display with the translation input.

17. A non-transitory computer readable medium storing computer program code configured, working with at least one processor, to cause the method as claimed in claim 15 to be performed.

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